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assigned to them can not be denied, and this is the simplest interpretation that embryologists have given to their results; but it is improbable that the differences between whole and partial development rest on this condition alone. The phenomena are really more complicated, as shown when whole development occurs even after the materials of the egg have become shut up within cells, and as shown in regeneration when a whole animal of smaller size develops from a part of the body of a fully formed organism.

The final chapter deals with the influence of external factors, and, although compressed into very small compass, most of the modern work is referred to at least briefly. The author's conclusion that external factors play in most cases only a minor rôle in development will be conceded by most students of experimental embryology. Nevertheless, important results have been already obtained from a study of external factors and our causal knowledge of the physiology of development rests in the main on evidence from such studies. Whether the formative changes are simply a complex of physiological relations or depend on factors not usually considered by physiologists is at present a question of opinion rather than of demonstration.

While we have found ourselves obliged in many cases to urge that many of the conclusions reached by the author still remain uncertain, and in other cases to take issue with the author's summaries of the present state of affairs, yet it should be repeated that the chief value of the book lies less in such generalizations than in the conscientious, full and exact review of the literature. The results so far obtained are marshaled forth in excellent order and the book is a valuable storehouse of materials, and will be found useful not only to those who do not have access to the original literature or time to digest it, but also to those who have felt themselves somewhat overwhelmed by the rapid development of this branch of embryology. The general reader, too, will find in this volume a well-balanced summing up of the more important results of the school of experimental embryology.

M.

ICHTHYOLOGY

Jordan on Fishes.[1]—In a single large volume President Jordan presents "virtually all the non-technical material contained in the author's *Guide to the Study of Fishes*. . . . His chief aim has been to make it interesting to nature-lovers and anglers, and instructive to all who open its pages.''

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[1] Fishes. By David Starr Jordan, President of Leland Stanford Junior University. New York, Henry Holt and Company, 1907. Large 8vo, XVI + 789 pp., 18 colored plates and 673 figures. $6.00.

President Jordan can appeal to readers of any age. A delightful account of the ''breeding habits of our smallest sea-horse, prepared by the writer for a book of children's stories'' is found on page 453. In the first chapter the author says that to ''understand a fish we must first go and catch one.'' It is apparently with a boy companion that he starts for the old swimming hole where they catch a sunfish—''a little, flapping, unhappy, living plate of brown and blue and orange, with fins wide-spread and eyes red with rage.'' In describing its life-history, eating is said to be about the only thing a fish cares for. The black swallower engulfs a fish many times larger than itself (Gill); a single goosefish has been found with seven wild ducks in its stomach (Goode); the pike is a mere machine for the assimilation of other organisms; and the bluefish is an animated chopping machine—an unmitigated butcher (Baird). Nevertheless it is fortunate that the fishes can express no opinion as to two-mile seines and some features of the canning industry!

A general description of the structure of fishes, of their habits, adaptations, colors, distribution and economic value, of the mermaid industry and the sea-serpent myths, form the first section of the book—ten chapters.

In the remainder of the book fishes are considered systematically, from Branchiostoma to Malthopsis. In behalf of stability, ''the sole function of the law of priority,'' several familiar and established names have disappeared. Lepisosteus replaces the ''more correct but also more recent spelling, Lepidosteus.'' The general reader, interested in the fishes rather than their names, will find that ichthyological terminology has been made as unobtrusive as possible. Such terms as slippery-dick and pop-eye grenadier make amends for considerable Greek, and common names are freely used.

The reading of this book is not like a visit to a museum, or even to an aquarium; there is more of out-doors about it. In part this is due to quotations from anglers, classic and modern, including Van Dyke's apostrophe to the ouananiche. Chiefly it is due to the author's own experiences and such unexpected comments as—''This is the noted Aweoweo of the Hawaiians which used to come into the bays in myriads at the period of death of royalty. It is still abundant, even after Hawaiian royalty has passed away.'' Or—''The coral reefs of the tropics are the centers of fish-life, the cities in fish economy. The fresh waters, the arctic waters, the deep sea and the open sea represent forms of ichthyic back-woods, where change goes on more slowly.'' Rarely there is a defective or ambiguous sentence, such as—''Turner gives an account of a frozen individual swallowed by a dog which escaped in safety after being thawed out by the heat of the dog's stomach,'' but the book, as would be expected, is exceptionally well written. It is also well illustrated, and the figures (except Fig. 268) are carefully placed to accompany the text. They include a considerable number of photographs of living fishes, and eighteen colored plates, chiefly of fishes from the coral reefs of Samoa. The volume is attractively printed, except that Chapter XI, The Collection of Fishes, begins with a page on The Classification of Fishes (p. 157); whether the mistake is in omitting the rest of the chapter on classification or in printing its first page is not apparent.

An illustrated description of the changes in the external form of fish eggs during their development, further accounts of nest-building, and the quotation of Brooks' vivid descriptions of the salmon or shad, might perhaps have added to the popular interest in the book. It is, however, sufficiently large, and is full of authoritative information. It accomplishes all that President Jordan planned, and is a comprehensive introduction to a scientific knowledge of fish.

FREDERIC T. LEWIS.

(*No. 495 was issued on April 20, 1908.*)